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(54) Telescopic drawer slides

(57) A fixed rail 20, an intermediate 22, and a sliding rail 24 are telescopically slidable on rolling bearings and have catches 52, 56, 54 to control relative movement of the rails 22, 24 so that, on pulling out, the rail 24 can be slid out of the rail 22 only when the rail 22 is fully pulled out, and so that, on pushing back, the rail 22 can be slid back into the rail 20 only after the rail 24 has been slid back into the rail 22.

Fig. 3

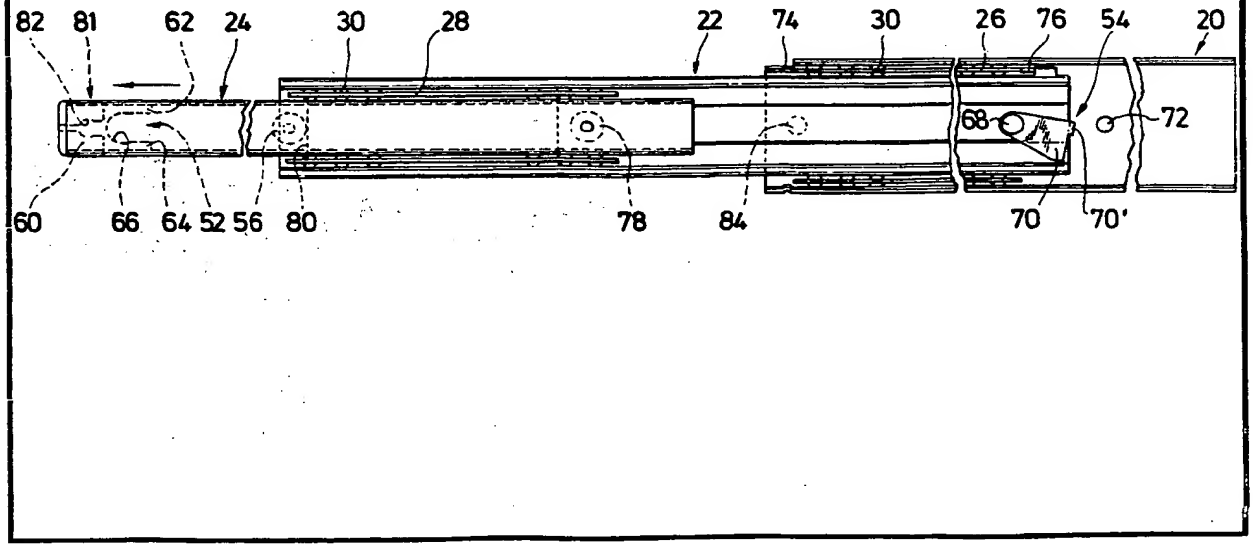

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Fig. 1

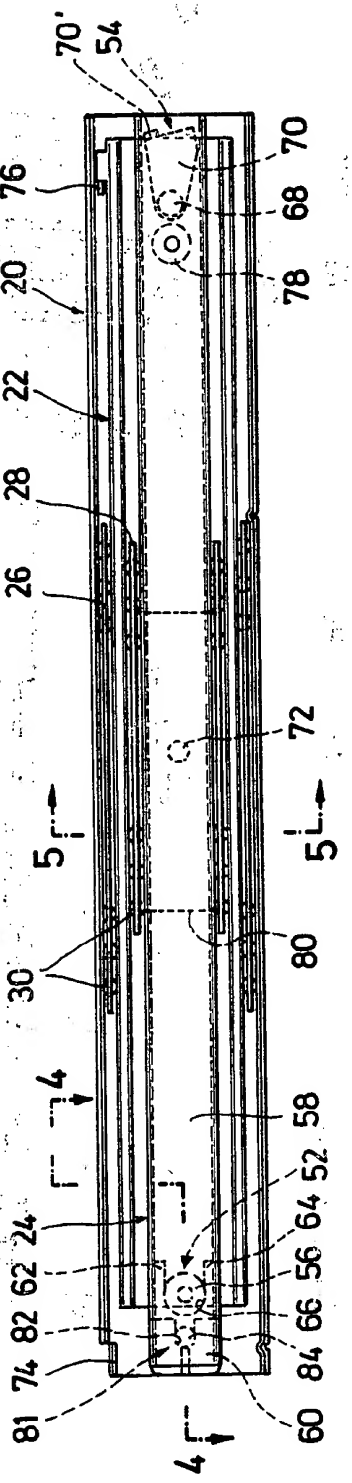

Fig. 2

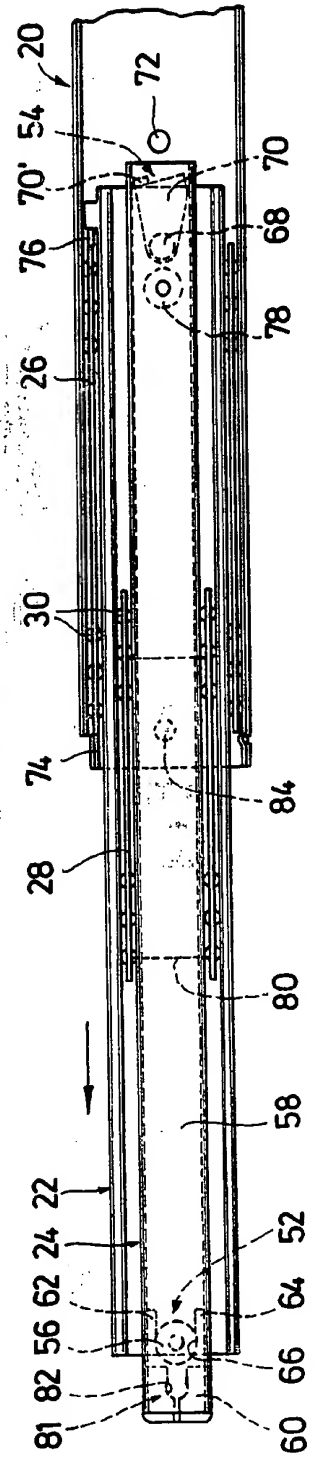

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Fig. 3

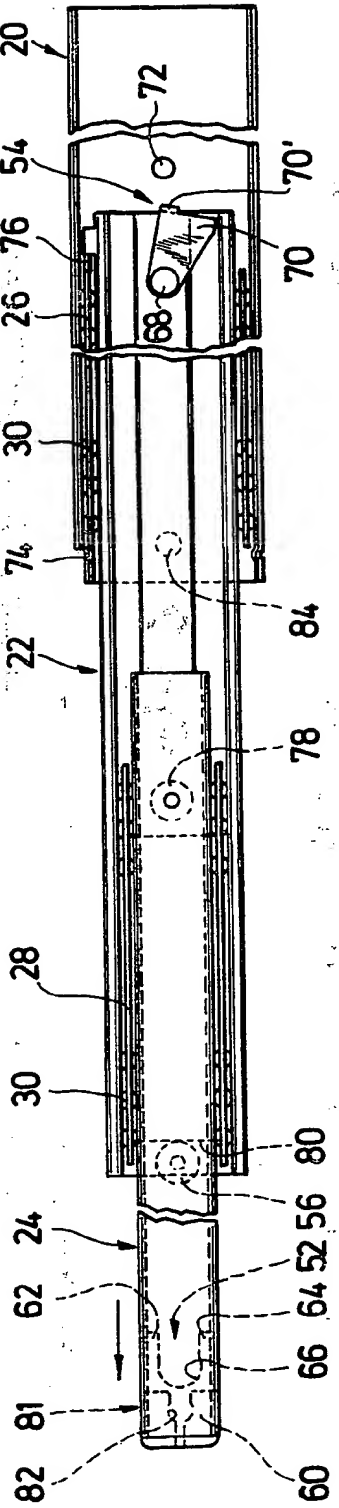


Fig. 5

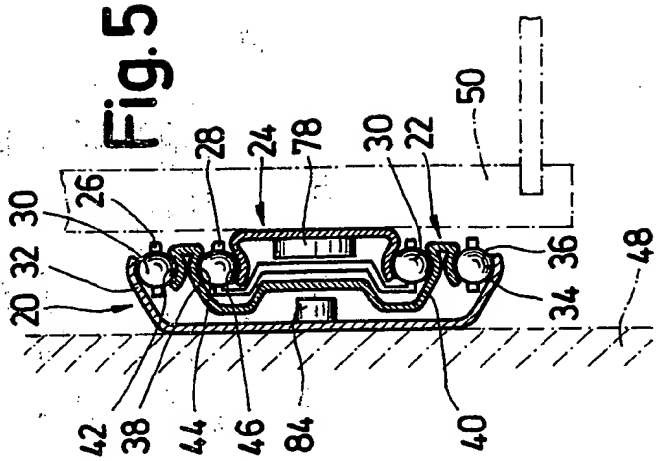


Fig. 4

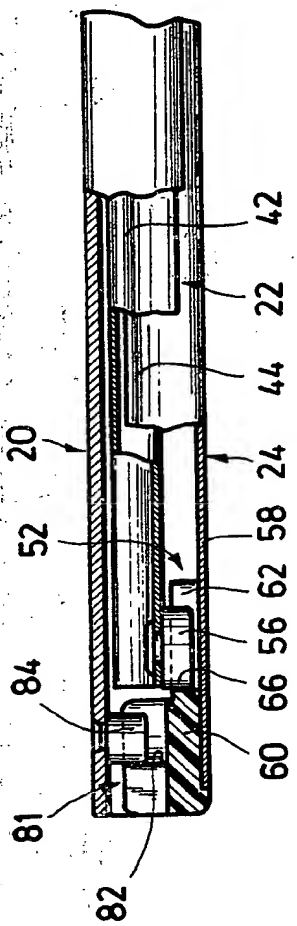


Fig. 6

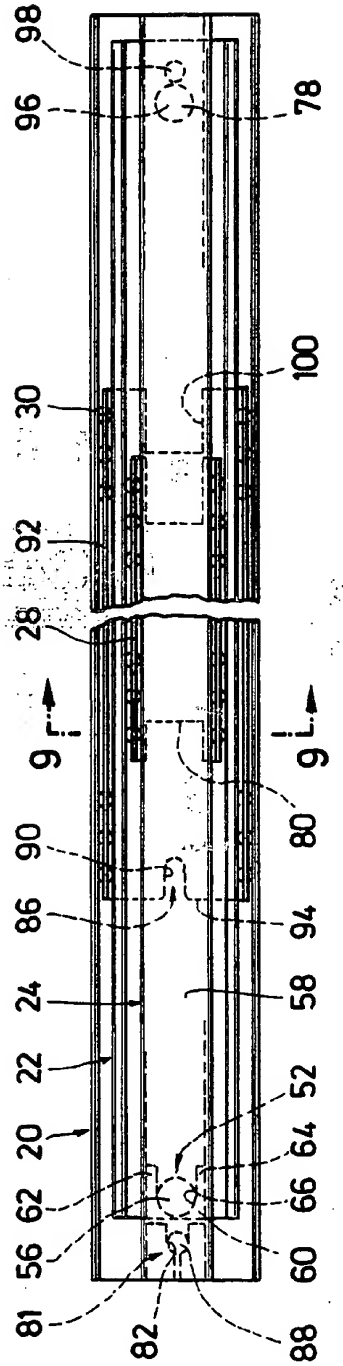
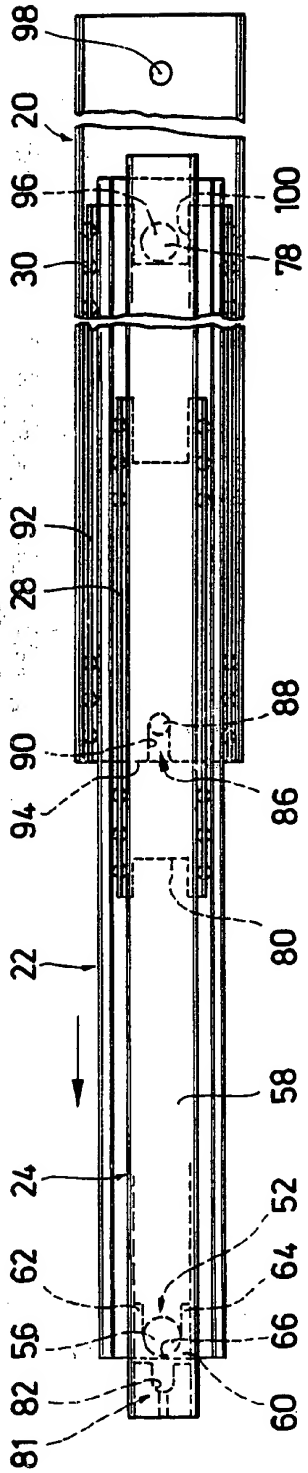


Fig. 7



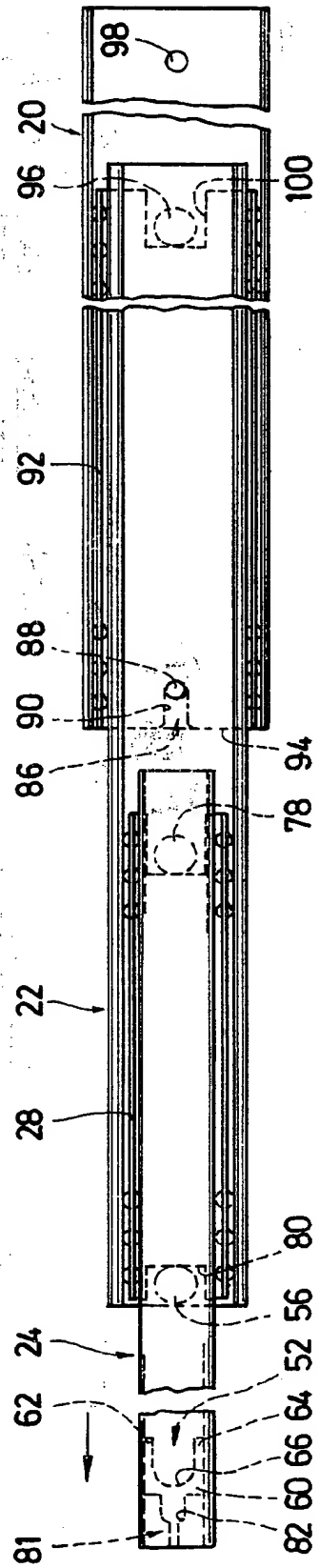


Fig. 8

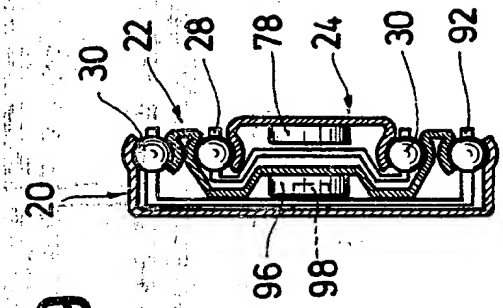


Fig. 9

Fig. 10

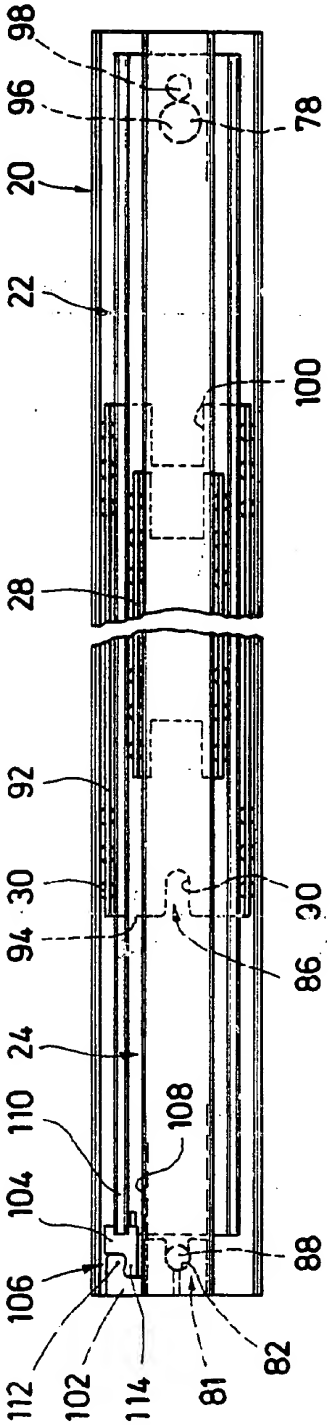


Fig. 11

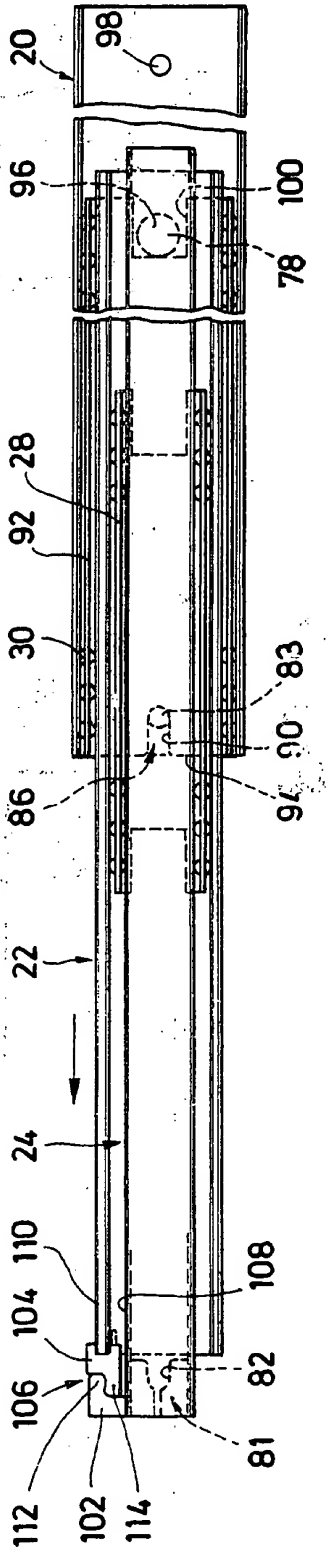
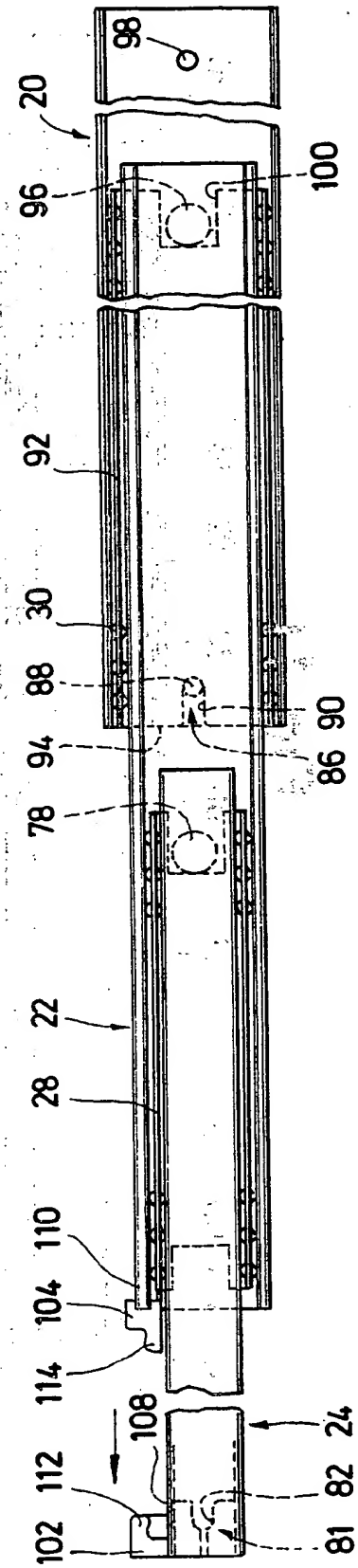


Fig. 12



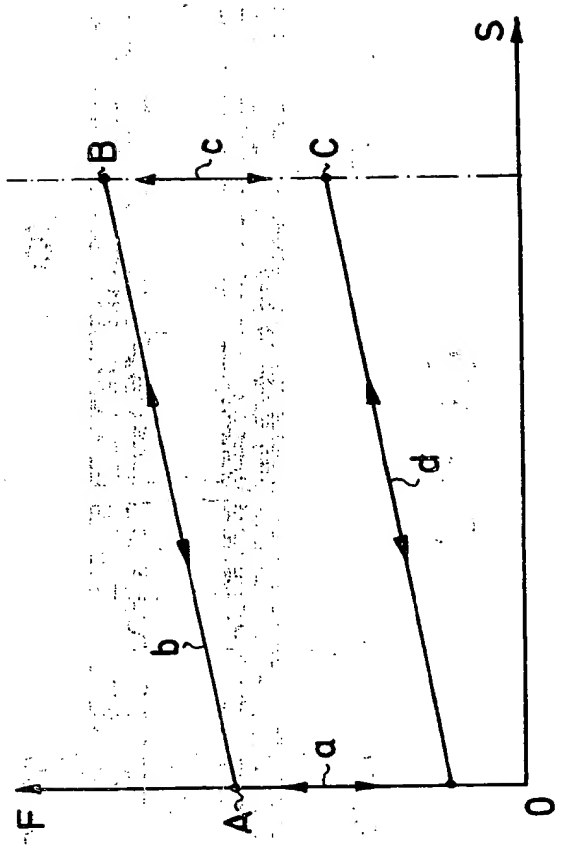


Fig. 13

SPECIFICATION

Double pull-out device for the straight guiding of a component such as a drawer

This invention concerns a double pull-out device for the straight guiding of a component movable backwards and forwards, eg a drawer comprising an outer rail, a middle rail, and an inner rail, the rails being provided with rolling bearings so as to be slidable telescopically into each other and being provided with stops to define their maximum pulled-out positions, one of the inner and outer rails being adapted to be mounted on a support to serve as a fixed rail while the other serves as a sliding rail, Such devices enable drawers or similar components to be pulled out to full length from the housing holding them.

In such cases, the movable rails are fitted to move backwards and forwards freely into each other, which usually means that when the drawer is pulled out the first rail to move outwards is the one taking the load or bearing the drawer. As soon as this then reaches its pull-out position fixed by a stop the middle rail is, on further pulling, necessarily conveyed into its maximum pull-out position. When drawers are pushed back, the rails move in inverse sequence, namely in such a way that the middle rail moves back into its original position before the rail bearing the drawer is set in motion relative to it.

The process of moving the rails completed in the way described results in the following disadvantages. If, for example, a drawer is pulled out of the body of a cabinet, the rail bearing it when in fully pulled out positions turns the middle rail into a projecting lever. If the contents of the drawer are relatively heavy, this means that when the middle rail is pulled out the surfaces bearing it are subject to a very great dynamic load due to the lifting moment resulting from the lever, which continously increases up to a maximum when the middle rail is pulled out, as the lever is lengthened. Consequently, the profiles of stationary and middle rails must be so dimensioned that even under extreme load conditions their running surfaces must be able to withstand the resulting enormous friction or surface pressure for lengthy periods.

What is desired is a double pull-out device of the kind described above in which, when the movable rails are moved outwards, the surfaces guiding the middle rail are subject to a dynamic load merely at the initial and, on the return, at the end stage of their movement and are subject to only a static load for the remaining part of the movement, when the lifting moment rises to a maximum value.

The present invention provides a double pull-out device for the straight guiding of a component movable backwards and forwards, e.g. a drawer, comprising an outer rail, a middle rail, and an inner rail, the rails being provided with rolling bearings so as to be slidable telescopically into each other and being provided with stops to define their maximum pulled-out positions one of the inner and outer rails being adapted to be mounted on a support to serve as a fixed rail while the other serves as a sliding rail, the middle rail and the sliding rail having their movability necessarily controlled in relation to one another by catch means so that, on pulling out, the sliding rail can be slid out relative to the middle rail only when the middle rail is at its maximum pulled-out position and so that, on pushing back, the middle rail can be slid back into the fixed rail substantially only after the sliding rail has first been slid back relative to the middle rail.

The course of the sequence of movement adopted for the movable rails is such that a dynamic load is applied to the surfaces guiding the middle rail only until it reaches a pulled-out position. Along the section of the path taken by the movement, the lifting moment increases to an extent as yet incapable of detrimental effects on the guide surfaces. The subsequent movement of the sliding rail into its pulled-out position is then linked only with an increase in the static load of the surfaces guiding the middle rail, which therefore in no way influences the quality of the guide surfaces because the associated bearings are then in a state of rest. The invention accordingly offers the substantial advantage that because of the appreciable reduction achieved in dynamic load, either the rail profiles can be less heavily dimensioned or double pull-out devices of this kind can be loaded more heavily or have a longer working life.

The necessary movement of the movable rails for which the invention provides can be adapted with advantage to all known double pull-out devices, with the rails being carried on roller or ball bearings. Further, whether the outer or the inner rail bears the load is irrelevant. A further advantage is that the necessary movement of the rails can be controlled in each direction by a catch.

Such catches controlling the necessary movement may all or only partly act in a direction oriented at right angles to the lengthwise direction of the rails or entirely in the lengthwise direction of the rails. It is advantageous if at least the catch fixing the two movable rails to each other constitutes a limit force catch, its design then taking one of many forms. For example, a spring jack can be fitted to the one moving rail which acts with a corresponding projection in the other rail, which holds the sliding rail within the middle rail until it has reached its maximum pulled-out position. However, a turning roller can also be fitted to one rail, for example, which catches a projection shaped within the other rail, a hard elastic material then being

used for the roller in this case. Further, an appropriate stopper can be provided of hard rubber which co-operates by friction contact with a corresponding counter-member. However, preference is given to a stop catch for use as a limit force catch, the parts forming the catch being advantageously arranged within the region of the front end portions of the movable rails. In a preferred embodiment, the counter-stop member receiving the stop-member of this stop catch has a forked shape with elastic tines which define a stop recess whose maximum width is slightly larger than that of the entrance between the tines, so that the stop member can substantially fit close-locking into the stop recess. A stop catch of this kind acting in the lengthwise direction of the rails not only offers a reliably effective yet easily released reciprocating catch for the rails moving into one another, but also the further substantial advantage that, when the rails are in locked position, the sliding rail is efficiently stabilized upwards at the front end within the middle rail, the guide of this rail thereby being relieved of the load. The parts of the catch providing upwards stability may in this case be fitted either to the opposing flat sides of the two movable rails or to two of their lengthwise edges adjoining each other.

The catch fixing the middle rail into its maximum pull-out position to the fixed rail may be so shaped that it can be controlled by the sliding rail in such a way that it releases the middle rail as soon as the sliding rail is effectively pushed back into an intermediate position. A pawl may be provided for this purpose, suitably controlled by the sliding rail. However, a stop catch can be provided to equal advantage, in which case a particular advantage arises with double pull-out devices whose movable guide rails are caused to move by means of balls in a ball cage, in that the ball cage may be designed with U shaped section and, overlapping the middle guide rail on one flat side, can form a part of this stop catch by including for this purpose a stop recess in the ball cage, accessible from one of its ends and through a stop member co-operating with it and fitted to the stationary guide rail.

The invention will be described further, by way of example only, with reference to the accompanying drawings, in which :

Figure 1 is a side view of a first embodiment of a double pull-out device having a fixed outer rail, a single middle rail, and a sliding inner rail;

Figure 2 is a fragmentary side view of the device of Fig. 1, with the middle rail in its maximum pulled-out position;

Figure is a fragmentary side view of the device of Figs. 1 and 2, with the sliding rail being pulled out;

Figure 4 is a partial section along the line 4–4 in Fig. 1, on a larger scale;

Figure 5 is a section along the line 5–5 in Fig. 1, on a larger scale;

Figure 6 is a fragmentary side view of a second embodiment of a double pull-out device;

Figure 7 is a fragmentary side view of the device of Fig. 6 with the middle rail in its maximum pulled-out position;

Figure 8 is a fragmentary side view of the device of Fig. 6, with the sliding rail being pulled out;

Figure 9 is a section along the line 9–9 in Fig. 6, on a larger scale;

Figure 10 is a fragmentary side view of a third embodiment of a double pull-out device;

Figure 11 is a fragmentary side view of the device of Fig. 10, with the middle rail set in its maximum pulled-out position,

Figure 12 is a fragmentary side view of the device of Fig. 10, with the sliding rail being pulled; and

Figure 13 is a graph to enable comparisons between the loads on a known double pull-out device in accordance with the invention.

In all the embodiments illustrated, the double pull-out device comprises an outer rail 20, rail 22, and an inner rail 24, which are mounted so as to slide telescopically into each other by means of, e.g., balls in ball cages 26 and 28. The form taken by the rails themselves is known.

As can be seen from Fig. 5, the outer rail 20 is of C-shaped section, its wings 32 and 34 being formed with concave inner ball races 36. The middle rail 22 is of T-shaped section, its wings 38. 40 being folded and shaped so that they possess outer and inner ball races 42,44. The inner rail 24 has a reverse C-shaped section, its wings possessing outer ball races 56 symmetrical to the ball races 44. Between the adjoining ball races the balls 30 are guided in ball cages 26,28. The outer rail 20 is fitted in a cabinet 48 shown by dotted lines, and the inner rail 24 which constitutes the load-bearing sliding rail is fastened to a drawer 50, for example, also indicated in dotted lines.

The device is eqiupped with two catches 52 and 54, by which, when the rails 22 and 24 are moved, their sequence of movement is predetermined. The two catches operate in the lengthwise direction, the direction in which the rails move. The catch 52 fastens the inner rail 24 relative to the middle rail 22, and the catch 54 fastens the middle rail 22 in the push-in direction relative to the outer stationary rail 20 until the inner rail 24 has slid back into the middle rail 22.

The catch 52 is preferably a limit force catch acting as stop catch. It is formed by a stop member 56, e.g., in the form of cylindrical pin, fastened at the front end of the middle rail 22 and matched by a counter-stop member 60 on the opposite side of the wall section 58 of the inner rail 24; the member

60 is forked and its tines 62,64 can be resiliently forced apart sideways. The tines 62,64 define between them a stop recess 66 into which the stop member 56 fits in a substantially close-locking manner upon being moved in between the two tines 62,64 (see Figs. 1, 2 and 4).

The catch 54 has a pawl 70 which pivots on a pin 68 and which by the effect of gravity automatically turns into its stop position as shown in Fig. 3. A stop or nipple 72 is fitted to the inside of the stationary outer rail 20; the dog 70' on the pawl 70 in its stop position comes to rest against the nipple 72 when the middle rail 22 is moved back into the outer rail 20. The inner rail 24 acts as a control member in order to turn the pawl 70 into its release position (Figs. 1 and 2) as soon as the inner rail 24 has effectively been pushed right back within the middle rail 22. The components of the catch 52, 54 could be fitted on any of the rails.

To explain the sequence in which the moving rails travel, it may be assumed that the drawer 50 lies initially within the cabinet 48 and is to be pulled out. In its pushed-in position, the relative position of the rails is as shown in Fig. 1. The middle and inner rails are locked to each other by the stop catch 52. If the drawer is then pulled, the two rails 22,24 are accordingly pulled together from the stationary guide rail 20, both remaining locked to each other and therefore not undergoing any movement relative to each other.

Once the middle rail 22 has reached its maximum pulled-out position as shown in Fig. 2, governed by a stop or dog 74 formed in one of the outer guide rail 20, against which the ball cage 26 comes to a rest, against which in turn the middle rail 22 comes into contact with a rear stop or dog 76, the inner rail 24 bearing the drawer will be in the interim position shown in Fig. 2.

Further pulling of the drawer releases the stop catch 52, the counter-stop member 60 being freed from the stop member 56 so that subsequently the inner rail 24 can move relative to the middle rail 22 in its pulled-out position as in Fig. 3. This final position is fixed, for example, by the stop member 56 on the middle rail 22 coming to read against the end face 80 of the ball cage 28 (see Fig. 3). A stop or dog 78 fitted on the inner rail 24 ensures that the ball cage 28 approaches the stop member 56.

In the course of pulling out the inner rail 24, it releases the pawl 70 hinged to the rear end of the middle rail 22, so that, as in Fig. 3, it can turn downwards in its locking position, where its dog 70' will lie level with the nipple 72 on the outer rail 20. When the drawer 50 is to be closed and is pushed back, first the middle rail 22 will slide back slightly until the pawl dog 70' comes to a rest against the nipple 72, so that the middle rail 22 is fixed to the outer rail 20 and, accordingly, only the inner rail 24 can move into the middle rail 22 until it has reached its interim position shown in Fig. 2, in which it necessarily turns the pawl 70 upwards back into its release position. As soon as this has happened and the inner rail 24 is slid back into the middle rail 22, the middle rail 22 can move back relative to the outer rail 20 so that eventually both rails 22,24 jointly reach their initial position (Fig. 1).

The predetermined travel described when the rails are moved offers an advantage evident from the graph shown in Fig. 13. In the graph, S represents the distance the middle rail travels while F represents the load on it.

Firstly, the load on a known double pull-out device is explained by means of this graph. With known devices, when a drawer is pulled out, first the inner rail travels out from the middle rail, so that the inner rail while continuously extending over a certain distance forms a lever represented by the section *a*, resulting in subsequent loading of the middle rail being continuously increased by the weight of the drawer. The initial loading to be supported by the middle rail at the commencement of its travel is shown in a diagram at point A.

As the drawer is further pulled out, the middle rail is set in motion. Section *b* indicates that the middle rail begins to travel at a relatively high initial load and that in the course of its travel its load continuously increases up to point B, resulting in a very high dynamic load on the surfaces bearing the middle rail 22.

By comparison, the necessary sequence in which the rails move in accordance with the invention offers the advantage that on pulling out a drawer, the dynamic load is smaller initially and throughout the extension of the lever formed by the middle rail 22 and represented by section *d* to its maximum pulled-out position at poinc C.This means that the dynamic load on its bearing surfaces is correspondingly small. If, subsequently, the drawer is pulled out fully, and the inner rail 24 accordingly locked into its pulled-out position, as section C shows, the load rises continuously to the same maximum value at point B, but with the distinction that the increase in load now acts only statically on the bearings of the middle rail 22.

On returning the drawer, initially the static load on the bearings of the middle rail 22 accordingly reduces to point C as only the inner rail 24 moves into the middle rail 22, after which eventually a dynamic load is obtained on returning the middle rail 22, which load, however, reduces gradually to its initial value. Conversely, the middle rail in known double pull-out devices is again initially subject to a maximum dynamic load when the drawer is returned, and reaches static load only from point A.

The double pull-out device is equipped with a stop means 81 with the aid of which the movable rails can be fixed within the stationary rail. The stop means 81 preferably comprises a part integral with the counter-stop member 60 (e.g. a plastics moulding) and includes a stop recess 82 directed towards a stop pin 84 on the outer rail. The pin 84 is located at the front end of the outer rail 20 and, as Figs. 1 and 2 show, co-operates with the stop recess 82 when the rails are in telescoped position. This stop means may be so designed that forces acting at the stop pin 84 cause the inner rail and the middle rail necessarily to be pulled into the outer stationary rail in a defined initial position.

The design shown in Fig. 6 to 9 differs from that described above through the locking of the middle rail 22 in the outer rail 20 in its maximum pulled-out position. In this design, the catch provided for this purpose similarly takes the form of a limit force catch in the form of a stop catch 86 (Fig. 7) which acts in the lengthwise direction, the direction of travel. The stop member on the stop catch is a stop bolt 88 fitted to the inside of the outer stationary rail 20. This stop bolt is directed towards a stop recess 90 fitted to a ball cage 92 which serves to guide the balls 30 bearing the middle rail 22. For this purpose, the ball cage 92 has a U-shaped section and overlaps the middle rail 22 on the inside. A longitudinal stop recess 90 is made in the front face 94 of this ball cage, seen in the pull-out direction, stretching inwards from the face and, in the maximum pulled-out position of the middle rail 22, locking the ball cage 92 to the stop member 88.

The initial position of the middle rail within the outer rail is fixed by a dog 96 fitted to the inside of the middle rail 22 and co-operating in this position with a counter-dog 98 fitted to the inside of the outer rail 20. The dog 96, with the middle guide rail 22 in locked position in its maximum pulled-out state, locks into a corresponding recess 100 in the ball cage in order not to restrict the travel required for locking.

The locking of the inner rail 24 to the middle rail 22 is achieved with the aid of the stop catch 52 described above with reference to Figs. 1, 2 and 4. In this design, too, a stop means 81 is provided in order to hold the moving rails in their common initial position within the outer rail 4, with their stop member, however, taking the form of a stop bolt 88 fastened to the outer rail.

The design of the double pull-out device illustrated in Figs. 10 to 12 is identical to the double pull-out device described in Figs. 6 to 9 save for the stop catch to lock the inner rail 24 to the middle rail 22. In this embodiment, the catch parts 102,104 of the stop catch 106, similarly acting in the lengthwise direction (the direction of travel) of the rails, are fitted to a pair of adjoining edge pieces 108,110 of the moving rails 22,24. The counter-stop member 102 in this case includes a stop projection 112 stretching in the direction of the middle rail 22 at a distance from the lengthwise edge 108 of the rail 24 and directed towards a detent 114 in the stop member 104, at least one of these parts consisting of a resiliently deformable material and both being so shaped that the detent 114 in locked state holds the stop projections 112 substantially close-fitting.

CLAIMS

1. A double pull-out device for the straight guiding of a component movable backwards and forwards, e.g. a drawer, comprising an outer rail, a middle rail, and an inner rail, the rails being provided with rolling bearings so as to be slidable telescopically into each other and being provided with stops to define their maximum pulled-out positions, one of the inner and outer rails being adapted to be mounted on a support to serve as a fixed rail while the other serves as a sliding rail, the middle rail and the sliding rail having their movability necessarily controlled in relation to one another by catch means so that, on pulling out, the sliding rail can be slid out relative to the middle rail only when the middle rail is at its maximum pulled-out position and so that, on pushing back, the middle rail can be slid back into the fixed rail substantially only after the sliding rail has first been slid back relative to the middle rail.

2. A device as claimed in Claim 1, in which the catch means comprises at least one catch which acts in a direction transverse to the lengthwise direction of the rails.

3. A device as claimed in Claim 1 or 2, in which the catch means comprises at least one catch which acts in the lengthwise direction of the rails.

4. A device as claimed in any of Claims 1 to 3, in which the catch means comprises a limit force catch which connects the middle rail to the sliding rail until the middle rail is at its maximum pulled-out position.

5. A device as claimed in Claim 4, in which the limit force catch takes the form of a stop catch.

6. A device as claimed in Claim 5, in which the co-operating parts of the stop catch are in the front end portion of the length of the middle rail and the sliding rail respectively.

7. A device as claimed in Claim 5 or 6, in which the stop catch has a counter-stop member receiving the stop member and being in the form of a fork with resiliently deformable tines defining a stop recess in which the stop member fits in a substantially close-locking manner.

8. A device as claimed in Claim 6 or 7, in which the co-operating catch parts are fitted

to facing flat sides of the middle rail and sliding rail respectively.

9. A device as claimed in Claim 6 or 7, in which the co-operating catch parts are fitted to a pair of adjoining lengthwise edges of the middle rail and sliding rail respectively.

10. A device as claimed in any of Claims 1 to 9, in which the sliding and middle rails when both in the pushed-in position are lockable to the fixed rail by a click-stop means.

11. A device as claimed in Claim 10, in which a part of the clock-stop means is attached to the sliding rail.

12. A device as claimed in Claim 5 and Claim 11, in which the said part is integral with part of the stop catch.

13. A device as claimed in Claim 12, in which both parts are constituted by a plastics moulding.

14. A device as claimed in any of Claims 1 to 13, in which the catch means includes a catch for holding the middle rail in its maximum pulled-out position relative to the fixed rail, which catch comprises a pawl co-operating with a stop which, when the sliding rail is pulled out from the middle rail, automatically moves into a locking position and which, when the sliding rail is pushed back is moved by the sliding rail into a release position.

15. A device as claimed in any of Claims 1 to 13, in which the catch means includes a stop catch for holding the middle rail in its maximum pulled-out position relative to the fixed rail.

16. A device as claimed in Claim 15, in which the rolling bearings comprise balls in ball cages, and the ball cage between the fixed rail and the middle rail has a known U-shaped section and overlaps the middle rail on one flat side, a counter-stop member of the stop catch receiving a stop member and taking the form of a stop recess made either in the said ball cage or in the fixed rail, the stop member being fitted to the other.

17. A double pull-out device substantially as described herein with reference to, and as shown in, Figs. 1 to 5, Figs. 6 to 9, or Figs. 10 to 12 of the accompanying drawings.

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